



CITTÀ DI CARPI



HA VENIAM SCRIPTIS QUORUMMODI GLORIA NOBIS
CAUSA, SED UTILITAS OFFICIIQUE FUIT

COLLEGIUM RAMAZZINI ANNUAL RAMAZZINI DAYS 2014

**24-26 OCTOBER 2014
CARPI, ITALY**

**SCHEDULE OF EVENTS
SCIENTIFIC PROGRAM
ABSTRACTS BY SESSION**

RAMAZZINI DAYS 2014
24-26 October 2014

ORGANIZED BY:

Collegium Ramazzini
Comune di Carpi
Istituto Ramazzini

UNDER THE AUSPICES OF:

INAIL
Provincia di Modena
Azienda USL di Modena
Istituto Ramazzini

CHAIRPERSONS:

Alberto Bellelli, Mayor of Carpi
Philip J. Landrigan, President of the Collegium Ramazzini

SCIENTIFIC COMMITTEE:

Melissa McDiarmid, USA, Chair
Carol Rice, USA, Chair
Philip J. Landrigan, USA
Morando Soffritti, Italy
Henry Anderson, USA
Fiorella Belpoggi, Italy
Ludwine Casteleyn, Belgium
Brigitte Froneberg, Germany
James Melius, USA
Karel Van Damme, Belgium

ITALIAN ORGANIZING COMMITTEE:

Kathryn Knowles, Collegium Secretariat
Federica Scagliarini, Conference Co-Manager
Susanna Tassinari, Conference Staff
Erica Tommasini, Conference Co-Manager
Diane Woodford, Carpi Secretariat

RAMAZZINI DAYS 2014

Summary Schedule of Events

FRIDAY 24 OCTOBER 2014

11:00-14:00	Conference check-in <i>Lobby, Hotel Touring</i>
15:00-17:30	Council of Fellows Statutory Session (Fellows only) <i>Town Hall o Carpi</i>
18:30	Welcome aperitivo <i>Breakfast area, Hotel Touring</i>
19:30	Dinner <i>La Bottiglieria, Hotel Touring</i>

SATURDAY 25 OCTOBER 2014

9:00	Cultural outing for spouses/guests <i>Meet at the Hotel Touring</i>
9:00-11:15	Scientific Session I: “Silica Three Hundred Years Later: Occupational Exposure, Medical Monitoring, and Regulation” <i>Sala dei Mori, Palazzo dei Pio</i>
11:15-12:30	Attended Poster Session: “Work of the Fellows” <i>Sala dei Mori, Palazzo dei Pio</i>
12:30-13:45	Onsite Lunch <i>Sala dei Cervi, Palazzo dei Pio</i>
14:00-15:30	Scientific Session II: “Breakthroughs and best practices in regional and global scientific collaboration” <i>Sala dei Mori, Palazzo dei Pio</i>
15:30-18:00	Free time
18:15-19:30	Presentation of the Ramazzini Award and Ramazzini Lecture <i>Sala dei Mori, Palazzo dei Pio</i>
19:45	Social Dinner <i>Coaches depart directly for Ristorante L’Anatra</i>
22:15	Return to hotels and turn back the clocks

SUNDAY 26 OCTOBER 2014

9:30-13:00	Scientific Session III: “Life of the Collegium and Advocacy Planning 2015” <i>Sala dei Mori, Palazzo dei Pio</i>
13:30	Farewell lunch <i>La Bottiglieria, Hotel Touring</i>
15:00	WHO Collaborating Centers Meeting (optional) <i>Hotel Touring</i>
20:00	Optional no-host dinner for Sunday night guests <i>Pizzeria Re Artù</i>

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Scientific Program

SATURDAY 25 OCTOBER 2014

9:00 Cultural outing for spouses/guests
Meet at the Hotel Touring

9:00-11:15 Scientific Session I

“SILICA THREE HUNDRED YEARS LATER: OCCUPATIONAL EXPOSURE, MEDICAL MONITORING, AND REGULATION”

Chair: L. Christine Oliver, USA

Sala dei Mori, Palazzo dei Pio

The purpose of this scientific session is to shine a light on silica as a persistent and dangerous threat to the health of exposed workers worldwide, a threat that was well-described by Bernadino Ramazzini three-hundred years ago in 1713 when he wrote in *De Morbis Artificum* of lung disease in stone-cutters, sculptors, quarrymen, and other workers caused by a dust "so fine that it penetrated the ox-bladders hanging in the workshop..."

Collegium Ramazzini experts will bring us into the 21st century describing the hazards of occupational exposure to silica today. The discussion will focus on the following issues: 1) occupational silica exposures, new and old; 2) silica as a recognized human lung carcinogen and its interaction with other lung carcinogens such as tobacco smoke; 3) the role of silica and silicosis in tuberculosis; 4) issues relevant to medical surveillance of silica-exposed workers as set forth in OSHA's proposed silica standard; 5) the role of the US Government in protecting the health of silica-exposed workers; and 6) international variability in addressing the threat to worker health posed by silicosis.

9:00-9:15 Session introduction
L. Christine Oliver (USA)

9:15-9:30 Silica - old, new and emerging uses result in worker exposure
Carol H. Rice (USA)

9:30-9:45 Silica as a lung carcinogen
Arthur L. Frank (USA)

9:45-10:00 Silica in the head of the snake. Silica, gold mining, and tuberculosis in southern Africa
Rodney Ehrlich (South Africa)

10:00-10:15 Medical surveillance for silica-related disease: the Collegium responds to OSHA's proposed rulemaking
L. Christine Oliver (USA)

10:15-10:45 US Government role in recognizing, reducing, and regulating silica risk: 80 years and counting
Gregory R. Wagner (USA)

10:45-11:00 Coffee

11:00-11:15 Silicosis 300 years after Ramazzini: eradication in some countries, increased incidence in others
Sverre Langaard (Norway)

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11:15-11:45 Discussion

11:45-12:30 Attended Poster Session

“WORK OF THE FELLOWS”

Chairs: Melissa McDiarmid (USA) and Carol Rice (USA)

Sala dei Mori, Palazzo dei Pio

Sustainable Work 2020 - an advocacy platform for Horizon 2020

Maria Albin (Sweden)

Rapid risk assessment on factories and workers in Kamrangirchar slum, Dhaka, Bangladesh, December 2013

Patrick Almeida (Philippines)

Implementing a total worker health program through clinical integration of health protection and health promotion; one year later

Madelynn Azar-Cavanagh (USA)

Conceptual modeling of priority exposure pathways to assess the most severe potential health effects of tannery operations in Hazaribagh, Dhaka, Bangladesh

Casey Bartrem (USA)

Asbestos-induced lung cancer in Germany: is the compensation practice in accordance with the epidemiological findings?

Xaver Baur (Germany)

Ethics in the applied sciences: The challenge of preventing corporate influence over public health regulation.

Xaver Baur (Germany)

An advanced analytical method for measuring alkylphosphate metabolites may avoid exposure misclassification

Yoram Finkelstein (Israel)

Towards a breakthrough in scientific collaboration: a new Nobel prize for transdisciplinary Science?

David Gee (UK)

Characteristics and diagnostic evaluation of silica-exposed New York City underground urban workers

Roberto Lucchini (Italy/USA)

Prevention of the toxic effects of metals contained in batteries and e-waste/Waste Electric and Electronic Equipment (WEEE)

Gunnar Nordberg (Sweden)

Chronic lumbar vertebral column diseases due to overload of the spine in European countries

Daniela Pelclov (Czech Republic)

Markers of oxidative stress are elevated in workers exposed to iron oxide nanoparticles

Daniela Pelclov (Czech Republic)

Population trainings in a mining community, Armenia 2014

Varduhi Petrosyan (Armenia)

International collaborations to foster children’s environmental health

Peter D. Sly (Australia)

A model for early lung cancer detection (ELCD) in high risk occupational populations

Laura Welch (USA)

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12:30-13:45 Onsite Lunch
Sala dei Cervi, Palazzo dei Pio

14:00-15:30 Scientific Session II

"BREAKTHROUGHS AND BEST PRACTICES IN REGIONAL AND GLOBAL SCIENTIFIC COLLABORATION"

Chair: Daniela Pelclová (Czech Republic)
Sala dei Mori, Palazzo dei Pio

14:00-14:10 Session introduction
Daniela Pelclová (Czech Republic)

14:10-14:20 The NIEHS and Ramazzini Institute Collaboration: looking to the past and framing the future
John R. Bucher (USA) and **Fiorella Belpoggi** (Italy)

14:20-14:30 An Italian-Latin American scientific network to collaborate on asbestos-disease prevention
Pietro Comba (Italy) and **Benedetto Terracini** (Italy)

14:30-14:40 Small scale factory workers attending workers' clinics in Kamrangirchar, Dhaka, Bangladesh
Patrick Almeida (Philippines)

14:40-14:50 Using global partnerships to contest flawed health impact assessments. A case study on proposed coal-bed methane extraction in Scotland
Andrew Watterson (Scotland)

14:50-15:00 Initial site assessments in polluted communities in Armenia
Varduhi Petrosyan (Armenia)

15:00-15:10 Risk assessment on Taranto (Italy) integrated steel works
Giorgio Assennato (Italy)

15:10-15:40 Discussion

15:45-18:00 Free time

18:15-19:30 **Presentation of the Ramazzini Award and Ramazzini Lecture**
Sala dei Mori, Palazzo dei Pio

The 2014 Ramazzini Award will be conferred upon **Benedetto Terracini** (Italy) for his outstanding contributions as a pioneer of modern occupational epidemiology in Italy and throughout the world. His work has been constantly dedicated to improve workers' health through his research and advocacy on asbestos and other occupational and environmental exposures.

2014 Ramazzini Lecture **Epidemiological surveillance of occupational cancer in Latin American and other recently industrialized countries**

19:45 Social Dinner
Coaches depart directly for Ristorante L'Anatra

22:15 Return to hotels and turn back the clocks

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SUNDAY 26 OCTOBER 2014

9:30-13:00 Scientific Session III

“LIFE OF THE COLLEGIUM AND ADVOCACY PLANNING 2015”

Chair: Philip J. Landrigan (USA)

Sala dei Mori, Palazzo dei Pio

9:30-10:00 Proposed update to the Collegium Ramazzini statement on asbestos

Do increments of cumulative exposure to asbestos increase mesothelioma incidence and advance time to event?

Dario Mirabelli (Italy)

10:00-11:15 Discussion of Advocacy Planning 2015

11:15-11:45 Coffee

11:45-12:45 Committee Meetings

13:00 Conference Closing

13:30 Farewell lunch

La Bottiglieria, Hotel Touring

15:00 WHO Collaborating Centers Meeting (optional)

Hotel Touring

20:00 Optional no-host dinner for Sunday night guests

Pizzeria Re Artù

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Abstracts Scientific Session I

SILICA – OLD, NEW AND EMERGING USES RESULT IN WORKER EXPOSURE

Carol H. Rice, PhD, CIH

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University of Cincinnati, OH, USA

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Three examples will be presented to illustrate the continuing hazard posed to workers by occupational exposure to silica. These are as follows:

- **2013:** 2.8 mg/m³. The highest time-weighted-average (TWA) during hydraulic fracturing material supply. The worker was a sand mover, overseeing the supply of sand at various locations on the Sand Mover. Old sand, new operation, uncontrolled transfer points.
- **2014:** 6 mg/m³. The highest 8-hour time-weighted-average (TWA) exposure measured in a study of historical building restoration in Ireland. The worker used various grinders cutting sandstone. Old sandstone, old structure, uncontrolled power tools.
- **2014:** No measurements - yet. Micro-plastics in personal care scrubs and peels are being replaced with other abrasives, including silica. Old sand, new/expanding application, perhaps there is a less hazardous substitute?

Continued diligence is required. If it is silica, it is not just dust!

SILICA AS A LUNG CARCINOGEN

Arthur L. Frank, MD, PhD

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It was not always thought that silica was a carcinogen; it was not until the early 1980's that such suggestions were made. In retrospect, a review of some older data might have shed some light on this matter. Increasingly, the scientific literature made it clear that exposure to silica was a causative factor in lung cancer. This did not, of course, prevent the "usual suspects" from disagreeing with the growing literature, or the IARC conclusion that silica is a human lung carcinogen. Issues of continuing interest that will be discussed include possible synergism with smoking and whether underlying silicosis is needed to ascribe a lung cancer to silica exposure.

SILICA IN THE HEAD OF THE SNAKE. SILICA, GOLD MINING, AND TUBERCULOSIS IN SOUTHERN AFRICA

Rodney Ehrlich MD, PhD

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University of Cape Town, South Africa

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The presentation will briefly reflect on the following. The association between silica, silicosis and tuberculosis (TB) is currently of intense interest in at least two arenas in Southern Africa, faced as it is with the triple epidemic of silicosis, TB and HIV infection. First, public health policy makers and advocates have identified the mining industry as an important amplifier of TB

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risk via the continued production of silicosis. Second, litigation lawyers have launched a class action lawsuit against the gold mining industry for both silicosis and tuberculosis. The science is thus under pressure to answer two related questions. Will the elimination of silicosis via a more stringent silica standard protect against TB? Is radiological silicosis a necessary mediator of the effect of silica on TB risk?

A multidisciplinary perspective is helpful here. There is a voluminous body of epidemiologic evidence showing elevated TB risk in silica-using industries. However, few studies control for silicosis and even if they do, they are limited to radiological silicosis which in miners may represent as little as 20% of the actual occurrence. Laboratory research has become scarce but accumulated evidence indicates that crystalline silica reduces the lung's resistance to tuberculosis mycobacteria. Emerging historical work directs our attention to ways in which the science has been shaped by the interests of an important industry.

MEDICAL SURVEILLANCE FOR SILICA-RELATED DISEASE: THE COLLEGIUM RESPONDS TO OSHA'S PROPOSED RULEMAKING

L. Christine Oliver, MD

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In September, 2013 the U.S. Occupational Safety and Health Administration (OSHA) published its proposed silica standard reducing the permissible workplace exposure limit (PEL) by half to 50 mcg/m³. The proposed standard provides for medical surveillance of exposed workers, with provisions for timing and periodicity of initial and follow-up medical exams; exposure trigger for implementation of medical monitoring; and sharing of medical information by the "physician or other licensed health care provider" conducting the exams. Notably absent is provision for medical removal protection (MRP).

In April, 2014 the Collegium Ramazzini presented oral testimony and written comments regarding the proposed standard to OSHA. Recommendations included standardization of testing and use of the action level (25 mcg/m³) to trigger medical monitoring. Inclusion of specific provisions for MRP and protection of medical confidentiality were strongly recommended. Post-hearing comments advised lung cancer screening for at-risk workers. The presentation provides an overview of these issues, Collegium recommendations, and rationale.

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US GOVERNMENT ROLE IN RECOGNIZING, REDUCING, AND REGULATING SILICA RISK: 80 YEARS AND COUNTING

Gregory R. Wagner, MD

Senior Advisor to the Director,

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In the late 1920s and early 1930s, intense uncontrolled exposure to crystalline silica in an industrial tunneling project in the U.S. caused hundreds of deaths from acute and accelerated silicosis. This disaster attracted national attention, stimulated congressional hearings, and caused Frances Perkins, the first US Secretary of Labor, to convene a scientific commission to identify ways to prevent future similar disasters. On receiving the commission's report, Secretary Perkins noted that silicosis prevention depends on the implementation of dust control interventions that were already known at that time.

We knew then how to control silica exposure, and we know now. Nonetheless, silicosis has persisted, even as more has become known about the range of adverse effects from exposure to crystalline silica. This presentation will consider the actions to improve prevention that have been taken by U.S. governmental entities over the last 80 years, some of the opportunities that have been missed and barriers to prevention, and lessons that can be drawn from this ongoing saga.

SILICOSIS 300 YEARS AFTER RAMAZZINI: ERADICATION IN SOME COUNTRIES, INCREASED INCIDENCE IN OTHERS

Sverre Langård, MD

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Bernadino Ramazzini wrote in 1713 that for stonecutters “*who did not take sufficient precautions*”, their occupational exposure [to silica] could “*gradually cause their death*”. There is recent evidence that with adherence to Dr. Ramazzini's admonitions and recommendations, some Scandinavian countries have been able to eradicate silicosis. At the same time, in many developing countries both the incidence and prevalence of silicosis appear to be increasing rather than declining. To make matters worse, because of inadequate reporting systems in many of these countries, official statistics for silicosis may not accurately reflect the true situation. Possible reasons for the discrepancies and variation by country will be discussed and options for improvement explored.

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SUSTAINABLE WORK 2020- AN ADVOCACY PLATFORM FOR HORIZON 2020

Albin M, Abrahamsson K, Bodin T, Bohgard M, Gustavsson P, Järvholm B, Lagerlöf E.

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Background: The Nordic countries have a strong tradition in occupational health and safety research, as well as research on sustainable work systems. The strategic importance of sustainable work, as a resource for health, innovation and inclusive growth, is emphasized in the European innovation strategy, and also by the social partners. Therefore, workplace innovation and health needs to be a more visible and coherent theme in EUs research programme Horizon 2020.

Collaboration: During spring 2013, Swedish national network of occupational safety and health researchers initiated a dialogue with the social partners. All major employer's associations and trade unions supported the initiative, and it was given a grant by the Swedish Governmental Agency for Innovation Systems/VINNOVA for an advocacy platform on sustainable work as a resource for health, innovation and growth (<http://sustainablework2020.se/>). The aim was to influence sections, policy and calls for proposals in Horizon 2020, as well as to disseminate information about ongoing or forthcoming calls for proposals associated with this theme. A collaboration with national agencies (the Swedish Work Environment Authority, the Swedish Social Insurance Agency) has been formed. A national work-shop with international participation was held in Spring 2014, and another– hosted by national agencies – is planned for December this year. Contacts with a broad number of European researchers and authorities have been taken regarding Horizon's Strategic Programme 2016-2018 to promote "Europe at work" as a strategic focus.

The experience so far: It has been remarkably easy to find broad support for the concept of Sustainable work from key stakeholders. On a national level we can already see a positive effect on the dialogue between the researchers, social partners and national agencies. It is also likely that the platform will increase knowledge about Horizon 2020 among Swedish occupational safety and health researchers. However, although we have made great efforts to disentangle the time-table for when an interaction is possible with different steps in Horizon 2020, and key persons for such contacts, these windows of opportunity tend to be quite narrow. This makes it difficult to make full use of the broad base of expertise available within the platform. We expect to be able to use it for broad mapping of priorities and knowledge gaps which may create a basis for positions as an input to Horizon 2020, as well as to Swedish policymaking.

Applying the concept elsewhere? The EU considers a good and safe work environment an important factor for a high productivity and it is astonishing that this is not explicitly expressed in the new research program which aims at addressing key challenges. Further, the demographic shift supports a broader societal discussion about the dual gain for the workers and the economy from a sustainable working life. These aspects could potentially form the basis for new partnerships elsewhere.

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**RAPID RISK ASSESSMENT ON FACTORIES AND WORKERS IN
KAMRANGIRCHAR SLUM, DHAKA, BANGLADESH, DECEMBER 2013**

Grazia M. Caleo, Md Hasan Imam, Mohammad Sofiul Islam, Arefa Hossain Antora, Ruth L. Kauffman, Meggy Verputten, Ivan Gayton, Patrick Almeida, Kamalini Lokuge.
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Background: Kamrangirchar is a slum of around 440, 000 people in Dhaka, Bangladesh where workers in small scale factories are deemed to be engaged in a range of harmful activities. The workers are predominantly involved in the manufacturing and recycling of plastic, metal, garment, and leather products. This is a unique and complex scenario where people are potentially exposed to both occupational and environmental risks.

Rationale: Basic data on factories and workers were needed in order to profile the main factories and the factory workers related risk, morbidity and health seeking behaviour. Findings will support Médecins Sans Frontières (MSF') in defining future activities that could be offered to this neglected working population.

Objectives: To describe the in a sample of Kamrangirchar factories: type of factory, number of workers, use of chemicals, occupational risk, morbidity and workers' health seeking behaviour.

Method: The target area comprised 3 Wards and 32 Administrative areas (ADs). Small (<3 streets) homogeneous adjacent ADs were merged to give a total of 29 ADs areas. In each ADs area a random cluster assessment was conducted. Overall, 29 clusters of 30 factories/workers (870) pairs were expected to be investigated. Interviews were carried out with the factory manager and with one worker per factory.

Results: Between 2nd to 5th of December 2013, a total of 721 factories and workers were interviewed; 149 fewer pairs than expected. No refusals were observed. **Factories description:** The total number of workers declared by the factories responsible was 7,114 workers. Children under 15 years represented less than ten percent of the workers reported.

The mean factory size was 9.8 (95%CI: 8.7-11.0) workers per factory.

Factories varied on the range of activities carried out. Twenty-nine percent of factories reported use of potential harmful chemical substances. **Workers description:** Overall, 721 workers were interviewed: mean age was 26 years (range: 25-27), 74% were male, 95% lived in Kamrangirchar slum. About 31% of workers reported to be unable to read or write. The mean period of employment was 36 months, 72% reported an injury at some point since they started working in the factory. At the time of the interview, 93% of the workers were working without wearing personal protection equipment (PPE), 80% were working with a machine. About 52% of the workers reported that they had not been vaccinated against tetanus. Among the non-vaccinated, 42% were male workers. Twenty eight per cent of the workers reported to have been exposed to chemicals in the week preceding the interview. Workers who reported exposure to chemicals in the week preceding the interview, had a higher prevalence of illness than workers without exposure to chemicals for skin (36% vs. 29%), eyes (46% vs. 41%) and respiratory (54% vs 50%) diseases.

With regard to health seeking behaviour, 80% of the workers reported that they go to a pharmacy (e.g. drug shop) as their first health care contact point and 4% do not look for any care. The main reason for not accessing healthcare was the associated costs (e.g. consultation/drug).

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Discussion: This is a young and mobile population with poor working conditions characterised by lack of tetanus vaccination, lack of PPE, use of chemicals and use of machinery. This population is engaged in a variety of manufacturing and recycling activities that are unregulated. This assessment found poor health seeking behaviour and a high prevalence of morbidity, in particular for those exposed to chemicals.

The result of this assessment supported MSF in setting- up six factory workers' clinics where free health care is offered to this to this working population, including vaccination against tetanus.

IMPLEMENTING A TOTAL WORKER HEALTH PROGRAM THROUGH CLINICAL INTEGRATION OF HEALTH PROTECTION AND HEALTH PROMOTION; ONE YEAR LATER

Brian W. Schroeder, JD, MPH¹; Brenda Schmidt, MS, MBA²; Johanna Millan, MPA¹; Julia Nicolaou, MPH¹; Marissa L. Hudson²; Madelynn Azar-Cavanagh, MD, MPH, FACOEM¹; Eric Dinenberg, MD, MPH²; Roberto Lucchini, MD¹

¹Icahn School of Medicine at Mount Sinai

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Aims:

- Describe the Total Worker Health™ model of integrating occupational safety and health protection with health promotion to prevent worker injury and illness and to advance health and well-being.
- Describe the Total Worker Health™ Affiliate program
- Describe the Total Worker Health™ Clinical Center of Excellence

Emerging evidence recognizes that both work-related factors and health factors jointly contribute to health and safety problems that confront today's workers and their families. Traditionally, workplace health and safety programs have been compartmentalized. A growing body of science supports the effectiveness of workplace interventions that integrate health protection and health promotion programs. Total Worker Health (TWH)™ is defined as a strategy integrating occupational safety and health protection with health promotion to prevent worker injury and illness and to advance worker health and well-being.

The Mount Sinai Health System signed a Memorandum of Agreement under the NIOSH TWH™ Affiliate program. The TWH™ affiliate program aims to increase the visibility, uptake, and impact of TWH™ to advance the safety, health and well-being of workers. As a TWH™ affiliate, the Mount Sinai Health system agrees to advance the principles, policies and practices of TWH™ programs by conducting joint research, developing programs and interventions to improve the overall health, safety and well-being of workers.

In addition, as TWH™ Clinical Centers of Excellence, The Mount Sinai Health System will incorporate TWH™ into routine clinical care, incorporate TWH™ into the education and training of future health professionals, including clinical providers of occupational safety and health services, incorporate TWH™ into services offered to the community, incorporate TWH™ into occupational safety and health, public health, and health services research.

The Mount Sinai Selikoff Centers for Occupational Health (Selikoff Centers), the health care delivery cores for the Department of Preventive Medicine within the Icahn School of Medicine at Mount Sinai, will offer health promotion services to its patients and collaborate

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with employers to develop comprehensive workplace health and safety programs. The Selikoff Centers address work-related injury and illness prevention, diagnosis and treatment. As well as providing health promotion services such as the National Diabetes Prevention Program, Stress management and smoking cessation programs.

Additionally, the Department of Preventive Medicine will spearhead research initiatives to evaluate the effectiveness of TWH™ interventions and train future health care professionals on integrated TWH strategies through its residency training programs in general preventive medicine and occupational and environmental medicine.

The Mount Sinai Health System combines the Icahn School of Medicine at Mount Sinai and seven hospital campuses to provide the highest quality health care throughout the New York metropolitan area. Sinai Fit is the newly branded health and wellness initiative for the health system's 36,000 employees. Following a TWH™ approach Sinai Fit aims to integrate where possible the traditional occupational health services with employer sponsored health protection and promotion programs.

Employers have the opportunity to positively impact the health of workers and their families through the integration of health protection and health promotion programs. The Mount Sinai Health system will continue to develop programs that integrate health protection and health promotion as well as assess the effectiveness of these programs.

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CONCEPTUAL MODELING OF PRIORITY EXPOSURE PATHWAYS TO ASSESS THE MOST SEVERE POTENTIAL HEALTH EFFECTS OF TANNERY OPERATIONS IN HAZARIBAGH, DHAKA, BANGLADESH

Casey Bartrem, TerraGraphics International Foundation, PhD Candidate: University of Idaho
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A preliminary conceptual model to illustrate potential environmental exposures resulting from severe tannery pollution was developed after a collaborative risk assessment effort. Dhaka, Bangladesh is the most densely populated city in the world.¹ Hazaribagh district, located in the region of the city known as “Old Dhaka”, is well known for its hundreds of leather processing facilities. In addition to housing more than 90% of Bangladesh’s tanneries, Hazaribagh is home to 185,000 people, 8,000 – 12,000 of which work in the tanneries themselves.² Human Rights Watch (HRW) estimates 150 tanneries in the four square kilometer area of Hazaribagh.³ Serious occupational and environmental hazards put community members at risk of severe long-term health impacts on a daily basis. Seventy five (75) metric tons of solid wastes and 21,600 m³ of liquid wastes are generated each day. This amount more than doubles during peak production periods. Chemicals used in processing include sulfuric acid, sodium sulfide, formaldehyde, azocolorants, chromium, pentachlorophenol, lime, bleach, and heavy metals.⁴ Tanneries pump effluent directly into open canals which flow through low-quality housing areas and into the nearby Buriganga River.⁵ Informal secondary waste recovery operations include burning or boiling processed leather scraps and scavenging for these scraps in the effluent canals and river.

Following a conference on occupational and environmental health in February 2014, sponsored by Dhaka Community Hospital Trust, Collegium Ramazzini (CR), International Social Security Association, International Labor Organization, Alliance for Bangladesh Worker Safety, TerraGraphics International Foundation (TIFO), Society for Occupational and Environmental Health, and Harvard School of Public Health, five members of TIFO (two of whom are CR members) joined Medecins Sans Frontieres (MSF, Doctors without Borders) to assess occupational and environmental exposures in factory and tannery operations in Kamrangichar and Hazaribagh Districts of Dhaka. MSF operates health clinics in the two slums and has since opened occupational health clinics in the areas. The team toured tannery operations, waste exploitation facilities, and local residences. Field data was combined with a review of available literature and reports regarding environmental and human health concerns in the area and interviews with local health care providers, workers and industry representatives. Subsequently, TIFO developed a conceptual model to illustrate potential exposure pathways for residents and workers in Hazaribagh.

The model includes major sources of pollution, environmental media affected, principal contaminants of concern, environmental receptors, routes of exposure, and susceptible populations. The model identifies priority exposures that encompass the most severe potential

¹ Wendell Cox, “World Urban Population and Density: A 2012 Update,” *Newgeography*, March 5, 2012, <http://www.newgeography.com/content/002808-world-urban-areas-population-and-density-a-2012-update>.

² Blacksmith Institute, “Top Ten Toxic Threats: Hazaribagh, Bangladesh,” *WorstPolluted.org*, accessed January 31, 2014, http://www.worstpolluted.org/projects_reports/display/111.

³ Human Rights Watch, *Toxic Tanneries: The Health Repercussions of Bangladesh’s Hazaribagh Leather* (Human Rights Watch, October 2012), 6, <http://www.hrw.org/sites/default/files/reports/bangladesh1012webwcover.pdf>.

⁴ Human Rights Watch, *Toxic Tanneries: The Health Repercussions of Bangladesh’s Hazaribagh Leather*, October 2012, 9.

⁵ *Ibid.*, 20.

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health effects for the overall population and critical data gaps that must be filled to better understand risks posed to residents and workers.

The analysis indicates that all residents face high risk of health impacts due to soil, water, and air pollution, but notably that children are exceptionally vulnerable to this risk, especially those exposed during scavenging for secondary processing. Waste processing in Hazaribagh is likely to be the most hazardous occupation and pose some of the greatest threats to human health. Workers in informal secondary processing face more severe chemical exposures than those employed at larger tanning factories with industrial machinery. There is no separation of tanning industries and residential areas, with families living at the tanneries or informal waste processing areas. This results in little difference between the occupational exposures experienced by tannery workers and residential exposures experienced by those living in Hazaribagh.

ASBESTOS-INDUCED LUNG CANCER IN GERMANY: IS THE COMPENSATION PRACTICE IN ACCORDANCE WITH THE EPIDEMIOLOGICAL FINDINGS?

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Introduction and objective: More than 80 epidemiological studies on asbestos workers demonstrate worldwide a ratio between death rates due to lung cancer and those due to mesothelioma of at least **2 : 1** [1,2]. This is true for all types of asbestos fibers except crocidolite. So, each mesothelioma death can be regarded as a “signal tumor of work-related asbestos exposure” [3]. On the other hand, mesothelioma death rates are also suitable to evaluate the current compensation practice.

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Method: Published statistics on acknowledged asbestos-related mesothelioma and lung cancer cases of the German Statutory Accident Insurance Association (Berufsgenossenschaften) and the Federal Ministry of Labor and Social Affairs (BMAS) for the period 2002-2011 were analyzed [4].

Results: For lung cancer there were numbers of

- 33,499 claims, and
- 5,756 acknowledged cases with lung cancer death.

For mesothelioma, there were

- 13,100 claims, and
- 6,937 acknowledged cases with mesothelioma deaths.

This means that the ratio of death rates due to lung cancer and those due to mesothelioma in Germany is $6,937 : 5,756 = 0.83 : 1$ and not as expected at least **2 : 1**.

Discussion: There are two main reasons for this obviously too low figure of acknowledged lung cancer cases: First, many asbestos victims are not able to bring the requested “full proof” of the asbestos load of 25 fiber-years (due to insufficient documentation and failure of their former employers to provide information). Secondly, application of the asbestos fiber-year-model based on the qualified work history was introduced in the compensation system in 1992. This resulted initially in an increase of acknowledged lung cancers but was followed by a plateau from the mid 1990s onwards in contrast to the greatly increasing number of claims.

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The German accident insurance associations, Berufsgenossenschaften, have established their own Pathology Institute/Mesothelioma Register in a monopolistic way; the latter have started measuring asbestos bodies as well as asbestos fibers in lung specimens. Furthermore, high fiber or asbestos body concentrations were set as a prerequisite for acknowledgement of an asbestos-related disorder.

These largely self-determined and restrictive compensation practices, imposed by the Berufsgenossenschaften, are not scientifically-based and have to be corrected. A carefully collected work history cannot be replaced by counting asbestos bodies or asbestos fibers in the lung ashes of the asbestos victims, as is usually practiced. In particular, the short half-life of chrysotile will, on its own, falsify this simple technique very often.

As early as 1980 Irving Selikoff told us: "Patients should be compensated if there is documented history of occupational exposure to asbestos. I would like to add as an addendum that preferably more than ten years should have been elapsed since the onset of exposure".

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ETHICS IN THE APPLIED SCIENCES: THE CHALLENGE OF PREVENTING CORPORATE INFLUENCE OVER PUBLIC HEALTH REGULATION.

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Background: Science has both important epistemic and social authority. However, public health policy decisions are mostly the result of compromise where economic and/or stakeholder interests are factors. Public, environmental and occupational health questions are frequently conflicted by economic self-interest. As a result, pernicious alliances between scientists and corporations (industry, insurance, and other interest and lobby groups) have occurred, raising both ethical and scientific concerns of great relevance to the integrity of the scientific enterprise.

Methods: From the literature, examples of the exercise of influence over regulation that place the public interest secondary to the interests of powerful special interests have been extracted.

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Findings: Several examples (Asford et al, 2002, Grandjean, P., and Ozonoff 2013; LaDou et al, 2007; mendelson et al, 2011; Tong and Glantz, 2007) show how sound scientific reasoning and evidence-gathering are undermined through compromised scientific enquiry resulting, in turn, in the publication of misleading (“junk”) science used to influence decision-making and interventions in environmental or occupational health. Prominent examples include developing clinical guidelines in psychiatry and pediatrics, the denial of health risks relating to pesticides, POPs, soot from fossil fuels, benzene, phthalates, formaldehyde, trichloroethylene, silica, lead, secondhand smoke, CFC gases, causes of global warming, chemicals with the potential for adverse effects on the central (and peripheral) nervous system and endocrine disruption, or causing cancer and recent academic scandals. Ongoing examples are tobacco-company-funded studies and those of the asbestos industry.

Conclusions: These examples, which are only the tip of the proverbial iceberg of such pernicious influences on public health, show that compromised science and medicine can lead to premature death, preventable disease, and disability. Unless scientists address these concerns with greater vigilance, corporations and their retained researchers will continue to increase their profits through distorting the basic science through which medicine and public health are informed. Scientists have the expertise and the credibility to challenge industry’s disinformation and to demand evidence-based public health policy. When scientific evidence is distorted so as to endanger health, silence is not neutrality, it is complicity. There is a need for recommendations demanding evidence-based public health policy

Recommendations: A major task is that of preventing the undermining of scientific advisory boards such as WHO agencies and state organizations dealing with health issues. To achieve this, members of guideline panels or decision-making regulatory boards and researchers should be subjected to the highest scrutiny (Gluckman 2014), and must demonstrate independence from vested interests (Mendelson et al. 2011; Institute-of-Medicine 2011). They must be concerned not only with the science, but also with the ethical and moral dimensions of scientific enquiry. To avoid compromised science, we call for the implementation of strategies that will expose promotion of self-interest over the public interest, require rigorous unbiased peer review in public health literature, and implement ethics guidelines. Because of strong influence in the development of diagnostic guidelines, in health and environmental risk assessment, as well as in limit values panels, these voluntary roles should be recognized through credit at the academic level (comparable to teaching and research credits). Finally, ethics departments of medical and public health schools should focus on conflict-of-interest policies within the regular curriculum. The systemic, upstream drivers of unethical conduct must be challenged and resisted.

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**AN ADVANCED ANALYTICAL METHOD FOR MEASURING
ALKYLPHOSPHATE METABOLITES MAY AVOID EXPOSURE
MISCLASSIFICATION**

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Background: Urine dialkylphosphate metabolites are the gold standard measure of exposure to organophosphate (OP) pesticides. Current assays use gas chromatography (GC), requiring extraction and derivatization steps that may result in false negatives and differential exposure misclassification. New liquid chromatography (LC) assays offer improved accuracy, sensitivity and specificity for measuring OP metabolites.

Methods: We have developed a *direct* and quantitative LC/MS/MS (mass spectrometry) method for urine dialkylphosphates, which avoid the extraction step, using a reverse-phase LC column (ReproSil-Pur C18 AQ, 5- μ m) coupled with a tandem MS procedure. Six OP metabolites were directly analyzed by an auto sampler equipped Shimadzu VP series LC. The MS operated in negative mode due to the inherent negative charge of the dialkylphosphates.

Results: Urine samples taken from five women known to be exposed to OP pesticides, showed high levels of DMDTP (11.42-52.76ng/ml), DEP (1.58-11.03ng/ml), DMP (1.24-3.19ng/ml), and DETP (0.47-3.62ng/ml), and low levels of DMTP and DEDTP (LOQ<1ng/ml). Notably, typical LOQs for the more traditional GC-MS methods are higher (~5ng/ml) and several samples would have likely been classified as unexposed under the GC/MS method.

Discussion: As alkylphosphates are highly polar, organic phase separation results in variable recovery. Yet, despite several limitations (incomplete extraction, increased labor, higher LOQ) when compared to LC/MS/MS, the more complicated GC/MS assay is still widely used.

We propose direct comparisons of the specificity, sensitivity and accuracy of LC tandem MS methods with those of GC/MS. Because this novel analytic method avoids extraction and derivatization, it reduces the potential for measurement error and enables full recovery in fewer steps. With the constantly lowering of toxicity thresholds, novel methods that extend the limit of quantification are needed.

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TOWARDS A BREAKTHROUGH IN SCIENTIFIC COLLABORATION: A NEW NOBEL PRIZE FOR TRANSDISCIPLINARY SCIENCE?

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The production of 34 case studies in “Late Lessons from Early Warnings”, vols 1&2, (EEA, 2001, 2013), initiated and coordinated by David Gee ,(with Phillip Grandjean for the 2013 vol), involved the global collaboration of over 80 scientists and activists, from many different disciplines, including a dozen Fellows of Collegium Ramazzini.

The project illustrated the need and potential for (1) a possible book of other case studies, produced by the Collegium; (2), the need for more systems science conducted by teams of inter & transdisciplinary scientists; and (3) the need to incentivise more inter disciplinary science within universities and in scientific publications by the creation of a new Nobel prize for transdisciplinary science. Criteria could include a minimum of 12 scientists from at least 3 or 4 distinct disciplines. Obstacles to this idea are hostility, or indifference, to interdisciplinary science from mainstream science; and the max of 3 scientists per science prize specified in the founding regulations that implemented Alfred Nobel’s will of 1895. Preliminary queries in Stockholm and elsewhere suggest the barriers could be overcome. Could the Collegium Ramazzini help launch and progress this initiative?

CHARACTERISTICS AND DIAGNOSTIC EVALUATION OF SILICA-EXPOSED NEW YORK CITY UNDERGROUND URBAN WORKERS

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Background: Inhalation of free crystalline silica has long been associated with silicosis. However, identification and diagnostic assessment to assess silica-exposed individuals remain controversial.

Objective: To describe clinical characteristics of New York City underground miners, construction workers, and electricians (known colloquially as “sandhogs”) and to determine the relationship of clinical examination parameters to silicotic pulmonary changes on chest radiography (CR) and high-resolution computed tomography (HRCT).

Methods: Male New York City sandhogs (n=13) were examined at Mount Sinai Selikoff Centers for Occupational Health based on occupational history of silica exposure between 2004 to 2013. Standard medical services were provided, including a comprehensive medical history, physical examinations, spirometry, CR with B-reading, and HRCT. An additional 13 New York City sandhogs were screened in 2013 for silicosis (total n=26). HRCT screening protocol for these individuals was ≥ 15 years of occupational silica exposure and smoking ≥ 10 pack-years and individuals not meeting this criteria received CR with B-reading. Logistic regression was used to compare odds ratios (OR) of silicotic changes on either CR or HRCT with silicosis risk factors and exacerbating conditions including total years exposed, years without dust mask use, and medical co-morbidities.

Results: Demographic characteristics of the sandhogs are listed in Table 1. For each year of silica exposure, the likelihood of observing CR and/or HRCT silicotic changes increases by 22% (OR=1.22; 95% CI: 1.1, 1.4). Clinical findings that demonstrated a higher likelihood of silicosis-related CR or HRCT findings include shortness of breath symptom reporting (OR=13.4, 95%CI: 1.66, 107.8) after adjusting for obesity. Those with normal FVC or FEV1 typically were found not to have silica-related disease. In addition, 9 (50%) of individuals with silica-related findings had low FVC or restrictive pattern on spirometry. 84.6% of workers reported use of dust masks during the exposure period; nobody reported the use of respirators and fit testing. As expected, no significant associations were observed for dust mask use and silicosis-related CR or HRCT findings. Out of 11 sandhogs who had a CT scan, 5 (46%) had findings of coronary artery disease (CAD). For the 7/13 sandhogs meeting HRCT screening criteria, 6 (86%) showed nodular densities and and/or suspicious plaques characteristic of silicosis. For the 5/13 sandhogs who were not screened, all CRs were read as normal by B-readers.

Conclusion: We recommend that sandhogs minimize exposure to silica and utilize supplied-air respirators in all exposed circumstances, previous certified fit-testing. Annual physical examinations and radiographic screening are also recommended in addition to a diet and exercise program. HRCT is promising as a two-pronged screening approach for coronary artery disease and silicosis diagnoses, but further study is needed.

PREVENTION OF THE TOXIC EFFECTS OF METALS CONTAINED IN BATTERIES AND E-WASTE/WASTE ELECTRIC AND ELECTRONIC EQUIPMENT (WEEE)

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Introduction: Adverse health effects resulting from inadequate recycling of batteries and E-waste including the death of children from metal poisoning occur in developing countries. This increasing problem now is widely recognized as reviewed by Fowler et al 2014. The Geneva declaration (2013) also noted the health risks to children from inadequate management of E-waste.

Principles for Prevention: The Principles specified by Landrigan et al 2014 should be employed: For the work environment: Reduction of exposure, Monitoring of the work environment, Education and training and Authority. For the general environment principles are similar. There is a special recognized concern for the unique vulnerability of infants and children to poisoning by metals.

Achievement of prevention: The work environment where there is handling of batteries and e-waste (including computers, cell phones, printers and TVs), varies widely among countries; it is usually fairly well controlled in traditionally industrialized countries, but there is a need for improvements in some newly industrialized and in most developing countries. The situation is similar for the general environment. While much remains to be done in many countries in terms of introducing adequate regulation of e-waste handling and related implementation, there are examples of functioning systems. In Sweden regulation is in concert with EU and stipulates “Producer responsibility” for electric and electronic products and for batteries, meaning that importers and producers are responsible for collection and recycling of waste products and have to report amounts collected and recycled to the Swedish Environmental Protection Agency. The legislation aims at stimulating the development of products that contain fewer hazardous materials and are easier to recycle.

According to the WEEE-Directive EU 2002/96/EG, more than 4 kg of WEEE per person should be collected for recycling in Sweden in 2012. This goal was achieved and 16.5 kg / person was collected. Aims for battery collection are 75-95% for various categories and in 2012 64-79% was achieved. Further efforts are thus required to achieve the goals for battery collection. In Sweden 67000 tons of batteries were collected and recycled. More metal-containing waste was imported (and recycled) in Sweden than exported. Export is mainly to European countries. Lead batteries are recycled by a smelter in a town in South Sweden where the blood lead levels of children are monitored. In 2012-2013 the geometric mean value was 12 microg/L, i. e. a low level (Skerfving and Bergdahl 2014).

The example from Sweden shows that prevention of excessive metal exposures from electronic materials such as batteries are possible and similar preventive measures for batteries and E-waste could be implemented in other countries. Both developed and developing countries need these systems since the quantities of “e-waste” are growing at an exponential rate on a global basis.

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CHRONIC LUMBAR VERTEBRAL COLUMN DISEASES DUE TO OVERLOAD OF THE SPINE IN EUROPEAN COUNTRIES

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Introduction: Low-back pain disorders (LBDP) are very frequent diagnoses in contemporary populations. In the Czech Republic, LBDP caused by heavy-weight lifting or and/or by whole-body vibrations haven't been included in the List of Occupational diseases. Obviously, there are differences in the national lists of occupational diseases within the EU and worldwide.

Methods: A questionnaire focused on LBDP was sent to specialists of occupational diseases in European countries. The questionnaire included information about presence of LBDP in the national list of occupational diseases, hygienic and diagnostic criteria needed to be fulfilled for occupational disease or possible compensation for patients. Different systems, criteria and diagnoses for acceptance of LBDP as occupational disease have been compared in 23 selected European countries

Results: Among 23 European countries participating in the study; only 3 don't have a list of occupational diseases (Hungary, Netherlands, Macedonia). Diagnostic criteria differ substantially and research using various methods is in process in most EU countries. In 15 countries, LBDP due to spine overload can be compensated as an occupational disease; in addition, most countries accept accidents as a source of LBDP. Most of the countries use individual evaluation by both clinicians and hygienists/physiologists; in addition, some use computer models (Germany) or mathematical models (Netherlands).

Discussion: Several EU countries, including the Czech Republic, do not acknowledge LBDP as an occupational disease. According to the European schedule of Occupational Diseases, LBDP are recommended to be accepted as occupational diseases (items 2.501 and 2.502 in Annex II). In the Czech Republic, criteria to acknowledge this occupational disease in individual patients have been created, based on the results collected from the EU countries and results of a pilot study. 30 subjects have undergone neurological examination and magnetic resonance imaging of the lumbar spine. Working conditions of these patients are investigated both by standard physiology methods and Tecnomatix JACK software (Low back pain analysis, Static Strength Prediction and NIOSH lifting) focused on the load to the lumbar spine during occupational activities in comparison with NIOSH limits for disc L4/L5. Many of them are caused or worsened by occupational load of the vertebral column and spine. New criteria are intended for the inclusion of LBDP in the next update of Czech List of Occupational Diseases.

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MARKERS OF OXIDATIVE STRESS ARE ELEVATED IN WORKERS EXPOSED TO IRON OXIDE NANOPARTICLES

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Introduction: Nanoparticles have been increasingly commercially manufactured for use in medical, cosmetic, and industrial applications. Nevertheless, their potential adverse health effects are very little understood. Experimental studies suggest that these particles can be distributed in the important organs and may induce body damage for biological systems. Health assessment and medical surveillance of workers exposed to nanoparticles are challenging, as no biological exposure tests have yet been identified to monitor workers' exposure.

Methods: In the year 2013, the spatial distributions of total particle number and mass concentrations were determined in the workplace air of iron oxide pigments production plant using particle number concentration monitor (P-TRAK) and particle mass concentrations (DustTRAK DRX) monitor. Particle number size distributions were monitored by aerosol spectrometers SMPS and APS, covering the overall size range 15 nm-10 µm.

Results: Post-shift EBC and urine samples were harvested in 14 workers exposed to Fe₂O₃ and Fe₃O₄ (43.1±7.5 years), exposed for 10.1±4 years) and 14 controls (38.5±7.5 years). Malondialdehyde (MDA), 4-hydroxy-trans-hexenal (HHE), 4-hydroxy-trans-nonanal (HNE), aldehydes C₆-C₁₂, 8-isoprostaglandin F_{2α} (8-isoprostane), 8-hydroxy-2-deoxyguanosine (8-OHdG), 8-hydroxyguanosine (8-OHG), 5-hydroxymethyl uracil (5-OHMeU), o-tyrosine (o-Tyr), 3-chloro-tyrosine (3-Cl-Tyr), nitrotyrosine (NO-Tyr), and leukotrienes (LTs) were analyzed by LC-ESI-MS/MS. FeNO was measured by Hypair FeNO Medisoft.

Total aerosol concentrations in the workshops varied greatly in both space and time; median number concentrations were 11800 (10200-30800) particles/cm³ and mass concentrations 0.13 (0.1-0.32) mg/m³; 90% particles were smaller than 100 nm in diameter.

All markers of oxidation of lipids, nucleic acids, and proteins (MDA, HNE, HHE, C₆-C₁₁, isoprostane, 8-OHdG, 8-OHG, 5-OHMeU, 3-Cl-Tyr, NO-Tyr, o-Tyr), and LTB₄ were elevated (p<0.001), C₁₂ (p<0.05). There was no difference in cysteinyl LTs and FeNO, or EBC conductivity and pH. No markers were increased in the urine.

Conclusions: This pilot study in iron oxide workers suggests adverse effects of exposure to aerosol containing a high proportion of nano-sized fractions. This study confirms our data concerning nanoTiO₂[1]. Therefore, markers of oxidative stress in the EBC appear a suitable non-invasive method to monitor effect of nanoparticles during preventive examinations of the workers.

Acknowledgements: P28/1LF/6.

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POPULATION TRAININGS IN A MINING COMMUNITY, ARMENIA 2014

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This project was possible thanks to Blacksmith Institute and leadership of Andrew McCartor, Regional Program Director for East Europe and Central Asia.

Background: Akhtala is a small mining town in the north of Armenia. The poly-metallic ore processing has been using three tailing ponds for toxic waste: two are 13 km away from the community and one is inside the community. Findings from environmental risk assessments revealed that from 202 soil samples collected in the community 93.6% exceeded the Maximum Allowable Concentration (MAC) for Arsenic, 26.7% for Lead, 97.9% for Chromium and 100% of Cadmium in this community. The most polluted area was the church yard located in the middle of the town where the geometric means of arsenic and lead exceeded the MAC 5-12 times. In addition, Blood Lead Level Assessments (BLLA), showed that the geometric mean of blood lead levels in 39 children from 4-6 years old was 6.8 (ranging 3.6 – 15.5). Based on the results from soil and blood analysis, the research team developed an intervention program to train different groups in Akhtala on reducing the health risks associated with environmental health hazards particularly those of heavy metals.

Intervention: Based on thorough literature review we developed evidence-based training materials adapting them for the special needs of different population groups such as health care providers, main caregivers, teachers of schools and kindergartens, workers of the Mayor's office, NGOs and active community members. Training materials included presentations, training manuals and short brochures focusing on sources, exposure routes and effects of heavy metals, and measures to prevent the exposure such as individual/community hygiene and nutrition. We have also developed a questionnaire to assess the effectiveness of the community trainings which was pre-tested and finalized based on feedback from participants of the pre-test. The Institutional Review Board of the American University of Armenia approved the intervention and evaluation of the trainings.

Each training session began by providing participants with self-administered questionnaires for baseline knowledge assessment; the trainings were concluded with a follow-up self-administered questionnaire to evaluate the effectiveness of the trainings. To calculate the knowledge percent score using all the knowledge questions, the correct answers were assigned 1 and wrong or don't know answers 0. The knowledge percent score was computed by calculating the % of summative correct answer scores out of possible maximum score of 40.

Evaluation Results: The evaluation used survey results from 78 participants (parents and grandparents, school and kindergarten teachers, municipality officials, NGO representatives and other active citizens, and health providers). The majority of participants were women (87.2%) and the average age of the participants was 37.3 years old. Most participants were married (69.7%). Majority of the participants had college/university education with 32.0% having received higher (14 years and more) education and 24% professional (10-13 years) education. Approximately 48.7% of the sample population indicated that they were employed at the time of the survey.

The paired t-test identified that there was a statistically significant improvement between the baseline mean knowledge percent score of 59.6 and follow-up score of 83 (39.3% increase). The research team also carefully examined the effect of the previously conducted training in

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the frame of the BLL study on the mean knowledge % score. The participants of the BLL training were the main caregivers of children who were tested for their blood lead levels and they received leaflets and counseling during the training. The results of independent sample t-test indicated that those who had received BLL training had a 22.8% higher baseline mean knowledge score than those who did not receive BLL training ($p < 0.05$). However, both groups improved and reached the maximum level of the knowledge score at follow-up (84 vs. 83).

Conclusion: The evaluation results show that community trainings and parental counseling can be effective tools to improve knowledge of general public and parents. These findings suggest that training programs might be effective in helping to reduce the health risks of heavy metals in communities similar to Akhtala affected by activities of mining industries.

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INTERNATIONAL COLLABORATIONS TO FOSTER CHILDREN'S ENVIRONMENTAL HEALTH

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The recent publication in 2010 of the global burden of disease estimates highlight the growing burden imposed by chronic non-communicable diseases. Major risk factors and their contributions to disease burden have also been published. These estimates have been made using a rigorous methodology that requires a sufficient level of evidence for a risk factor to be included. This approach creates a structural bias against newly recognized or emerging risk factors. The intention to update these estimates annually may cause a greater problem if additional risk factors are not included. Adverse environmental exposures in early life are among the risk factors systematically excluded from the current burden of disease estimates. Yet understanding is increasing that many non-communicable diseases have their origin in early life.

In a deliberate attempt to increase awareness of and to provide scientific evidence supporting the contribution of early life environmental exposures to chronic disease, the World Health Organization has been expanding the number of collaborating centres that have been designated in areas relevant to children's environmental health (CEH). These centres are now forming into a network to ensure effective collaboration and coordination of research efforts. To date CEH collaborating centres have been designated in Australia, Mexico, South Korea, Thailand, the USA and Uruguay. Proposed collaborating centres in Brazil, Denmark and Japan are currently in the application process. The CEH network is formally coordinated by the collaborating centre at the National Institute of Environmental Health Sciences, USA and a website is under construction. The network will encourage participation from groups and organizations that may not be able to or may not wish to become WHO collaborating centres. Groups that have either joined the network or expressed interest in doing so include: the Collegium Ramazzini, the Pacific Basin Consortium for Environment and Health and the International Society for Children's Health and the Environment. The research priorities and activities of the network are in the process of being formulated but will likely have a concentration on improving assessment of early life exposures and developing short-term outcomes and biomarkers that predict long-term risk of chronic non-communicable diseases.

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A MODEL FOR EARLY LUNG CANCER DETECTION (ELCD) IN HIGH RISK OCCUPATIONAL POPULATIONS

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Objective: To present a model for early lung cancer detection (ELCD) in a high risk occupational cohort by applying a regionalized approach that links local providers with a regional center of excellence.

Background: Since 1996 the Building Trades National Medical Screening Program (btmed.org) has been providing occupational medical examinations to construction workers who have been employed in 27 nuclear weapons facilities across the United States. These workers have exposed to a variety of occupational lung carcinogens including asbestos, silica, welding fumes and radiation. They experience a significantly elevated risk for occupational lung cancer and COPD [Dement et al. 2009, 2010].

Historically, survival in patients with lung cancer has been low and largely unchanged, mostly as a result of diagnosis at a late stage when intervention effectiveness is limited. The history of screening for early stage lung cancer had not been very encouraging due to a lack of effective and practical screening tests, and was not recommended. In 2011, the Lung Cancer Screening Trial, conducted by the National Cancer Institute in the United States found that screening with Low Dose Computed Tomography (LDCT) reduced mortality by so much that the trial was stopped early [Aberle et al. 2011]. Subsequently lung cancer screening has been recommended by a large number of professional organizations and the US Preventive Services Task Force. As a result, in 2012 BTMED began to plan a model for screening for lung cancer. A challenge is that most nuclear weapons facilities are located in remote areas without immediate access to the high level medical specialization needed to mount a lung cancer screening program. To overcome this difficulty we decided to create a regionalized model which would link local screening facilities with regional lung cancer experts. An initial program for our participants who have been employed at the Hanford Nuclear Reservation in Washington State was launched in August 2013.

Materials and Methods: BTMed partnered with the Seattle Cancer Care Alliance (SCCA), which is designated by the National Cancer Institute as the Comprehensive Cancer Center in the Pacific Northwest, to screen individuals who have worked at the Hanford Nuclear Reservation, located in Richland, WA, some 320 km east from Seattle. Selection of eligible participants and screening procedures follow guidelines established by the National Comprehensive Cancer Network [NCCN 2013]. BTMed identifies participants who meet screening criteria, invites them for screening, and maintains a detailed data base on all procedures and outcomes. A local SCCA affiliate, Kadlec Regional Medical Center in Richland, administers the LDCT scan. The scans are transferred electronically from Kadlec to the SCCA for interpretation by a thoracic radiologist. The radiologist refers suspicious scans to a lung Nodule Board for a multi-disciplinary review by pulmonologists, radiologists, thoracic surgeons and medical oncologists. Patients requiring evaluation beyond a repeat LDCT are invited to come to the SCCA Lung Cancer Early Detection and Prevention Clinic. Any lung nodule that qualifies for surgical resection is referred to the SCCA Division of Cardiothoracic Surgery. LDCT are read within 24 hours, the nodule board review is performed within seven days, and diagnostic evaluation is scheduled as soon as possible.

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Results (numbers will be updated by Ramazzini Days): Of 2,870 former workers 555 (19.3%) met eligibility criteria for ELCD. Since August 2013, 201 (27%) workers have been screened. Of these 55 have been referred to the Nodule Board and 7 lung cancers (3.5%) have been detected (5 Stage I adenocarcinomas; 1 pending pathology confirmation, and 1 Stage IV squamous cell carcinoma). One Stage I patient died from post-surgical complications. The prevalence of lung cancers detected is significantly higher than projected based on previous risk experience. Radiation dose delivered with LDCT is approximately 0.85 mSv. Cost of screening is US \$ 8,000 per early stage lung cancer detected.

Discussion: We think our regionalized approach serves as a useful model that should be replicated, particularly for people who live in areas with limited access to multi-disciplinary, specialty care.

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THE NIEHS AND RAMAZZINI INSTITUTE COLLABORATION: LOOKING TO THE PAST AND FRAMING THE FUTURE

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In early 2000 NIEHS Director Dr. Ken Olden and RI Director Prof. Cesare Maltoni established a formal collaboration between the two institutions based on common interests particularly with respect to rodent cancer bioassays, interactions of genetic susceptibility and environmental exposures, basic mechanisms of carcinogenesis, and statistical methods for the evaluation of bioassay data. Over the past 14 years this agreement has been repeatedly renewed and numerous staff visits have occurred between the two institutions.

Initial topics included an in depth assessment of the different philosophical and practical approaches to the design and performance of rodent cancer studies, a topic discussed at the 2002 New York Academy of Sciences symposium honoring Prof. Maltoni. The RI need for an electronic data system for in life and pathology data capture was met by placement of the TDMSE system, in use by the NTP, in the RI. In parallel, efforts to assess the diagnostic consistency between the institutes were begun through a series of visits by Dr. Belpoggi to the NIEHS where lesions from RI studies were evaluated by NTP pathologists. During the years 2004-2007 pathology data from a number of RI studies were loaded onto TDMSE and made available through the RI website.

In 2009, agreement was reached to carry out formal Pathology Quality Assurance (QA) and Pathology Working Group (PWG) evaluations of selected RI studies. NTP pathologists visited the RI in April 2010 to conduct a limited review of pathology materials and processes in place at the RI. The USEPA expressed interest in cosponsoring these activities for a number of studies that were influential in on going risk assessments. In early 2011 a PWG was organized and convened at the RI to examine studies of acrylonitrile, vinyl chloride, methanol, MTBE and ETBE. The PWG review showed general agreement with the RI diagnoses, with some discrepancies in lymphoid neoplasms and neoplasms of the inner ear and cranium, where infection by respiratory pathogens made diagnoses difficult. Subsequent work under the collaboration has continued to examine methods to evaluate the clonality of lymphoid tissue in the lungs of RI study animals through immuno-histochemical and PCR-based approaches. RI ethanol-fixed paraffin embedded tissues have also been evaluated for their utility in gene expression studies using RNAseq.

Results are promising, but more work is needed. Ongoing efforts include preparing for a PWG on the collected RI aspartame studies and further applications of new technologies to enable greater utilization of the RI tissue archives. Future collaborations will address common interests in early life exposures to endocrine disruptive agents, with particular emphasis on mammary gland development and cancer, and in understanding the basis for non-monotonic dose responses seen in several RI cancer studies.

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AN ITALIAN-LATIN AMERICAN SCIENTIFIC NETWORK TO COLLABORATE ON ASBESTOS-DISEASE PREVENTION

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Asbestos disease prevention is an environmental public health issue calling for a transnational and cross-disciplinary approach to global health (1). Within the framework of the Italian National Asbestos Project (www.iss.it/amianto), several international collaborations have been developed focusing on asbestos-related research, training and dissemination activities both in countries where asbestos use is still permitted and in those where it has been banned. The Italian-Latin American network involves research and academic institutions, local and national authorities, as well as NGOs working on the prevention of asbestos-related disease. The present study is focused on data on asbestos consumption and epidemiological findings regarding Argentina, Brazil, Colombia, and Mexico. We provide an attempt to estimate the occupational burden of asbestos-related cancer for these four countries (the major asbestos consumers in the Region, among which a ban has been adopted only in Argentina). In this frame, we highlight the major sets of international scientific cooperation contributions to prevent asbestos-related disease at a global level.

Latin America was one of the Regions in the world where in the second half of the last century the global asbestos industry displaced industrial mining, processing and trade of this hazardous material. Asbestos consumption in Latin America peaked in 1980 with 356,033 tons, half of which consumed by Brazil. These activities are currently maintained and involve a widespread use of asbestos.

A causal association with asbestos exposure has been established and well documented for mesothelioma and cancers of the lung, larynx, and ovary. Given the long-time interval and the amount of asbestos consumption in these four Latin American countries, the impact of asbestos exposures in working and living environments on population health is becoming a priority for public health, calling for dedicated epidemiological studies. Indeed, all over Latin America, little research on asbestos and health has been performed. A search in Medline (April 18, 2014) with the keywords “asbestos”, “epidemiology” and the name of the country, identifies 9 entries for Mexico, 12 for Brazil, 4 for Argentina and one for Colombia.

An estimate at national level of the occupational cancer burden brought about by the industrial uses of asbestos would require detailed routine information on such uses as well as vital statistics of good quality. None of these conditions is fulfilled in these countries, so that an indirect approach has been used. The approach is based on available mortality data and on the estimation of the Population Attributable Fraction (PAF) for lung, larynx and ovary cancers, according to the method originally developed by Driscoll et al (2). The approach implies the use of the following data: a) proportion of workforce employed in each economic sector; b) proportion of workers exposed to asbestos in each sector (due to non-availability of these data for Latin American countries, we used data from the European CAREX database - carcinogen exposure database); c) occupational turnover; d) levels of exposure; e) proportion

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of the population in the workforce; f) relative risk for each considered disease for one or more levels of exposure.

Using mortality data of the WHO Health Statistics database for the year 2009 and applying the estimated values for PAFs, the number of estimated deaths in 5 years for mesothelioma and for lung, larynx, and ovary cancers attributable to occupational asbestos exposures, were respectively 735, 233, 29, 14 for Argentina; 340, 611, 68, 43 for Brazil; 255, 97, 14, 9 for Colombia, and 1,075, 219, 18, 22 for Mexico (3). The limitations in compiling the estimates underline the need for improvement in the quality of asbestos-related environmental and health data.

International cooperation aimed at primary prevention is to be pursued first of all by asbestos ban and environmental clean-up. As a first step, it should pursue improvements in asbestos exposure assessment addressed to the detection of worst-off situations deserving priority. Improvements in exposure assessment also contribute to the validity and informativeness of epidemiological studies. In the domain of epidemiological studies, international cooperation should be addressed to the specific goal of providing estimates of the impact of asbestos-related disease in local settings. To this end, improvements in the quality of mortality and cancer incidence data are needed, as well as integration of environmental and health data in well-designed study protocols. Finally, local experiences of health surveillance of exposed and ex-exposed subjects might benefit from compliance with international guidelines in this field, like e.g. those provided by ICOH 2014 (4).

In conclusion, availability of reliable figures on health impacts of asbestos at national level may constitute a step in the construction of collective awareness of the adverse effects of this agent, thus corroborating the need for the empowerment of a preventive/precautionary approach. Nowadays this process should strongly speed up in light of the unprecedented availability of technological approaches for open access leading to and disseminating the pertinent scientific evidence.

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SMALL SCALE FACTORY WORKERS ATTENDING WORKERS' CLINICS IN KAMRANGIRCHAR, DHAKA, BANGLADESH

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Background Kamrangirchar is one of the major slums of Dhaka, Bangladesh, with a population of around 440,000 concentrated in an area of just 3.68 km². Most are rural migrants, and their continued influx serves as a cheap source of labor resulting in the proliferation of hundreds of unregulated small scale factories in this residential area. The workers are exposed to unsafe work environments and the availability of health care is limited.

Rationale In 2014, the medical humanitarian agency Médecins Sans Frontières (MSF) started a Factory Workers' Programme following a 'rapid health assessment' done to determine an appropriate model of care. This is an initial intervention with limited enrollment, the outcomes of which will be utilized to spur involvement of stakeholders to eventually increase access to health care for this population and improve their health status. To enhance provision of care we did an analysis of routine programme data.

Objective To describe the clinic program approach, report our findings from analysis of clinic data, and discuss lessons learned emerging from the initial intervention.

Methods Between February and July 2014, 2520 workers from 117 factories in Kamrangirchar were invited to access health care in four MSF Factory Workers' Clinic on non- work days after discussions with community leaders and employers. Agreements were signed between the employers and MSF allowing registration of workers and factory visits.

Results 769 factory workers sought health care in four clinics with a total of 1470 consultations during the period.

Workers characteristics: Median age is 25 years (range: 8-72 years), 14% are under 18 years. 75% are males. Mean duration at current occupation is 2 years; 33% had been in their current job for <1 year. 33% are involved in metal moulding, welding, and recycling, 28% in plastic recycling and resin processing (mainly PVC), 23% in leather finishing and recycling, and 15% in garments. 63% worked in a factory previously. **Work situation:** 68% work 6 days/ week. An additional 31% work 7 days/ week. 89% work >8 hours/ day; 68% work 12 or more hours/ day. 52% use machinery. Most report ergonomic- related complaints (97%), exposure to heat (85%) and noise (50%). 53% report chemical exposure. 81% do not use any personal protective equipment. **Health status:** 59% of workers reported previous illness prior to current occupation; the most common were chronic gastritis (29%), chronic skin disorders (25%), jaundice (11%), respiratory disorders (10%), and previous surgery (7%). Of those who worked previously in a factory, 30% had history of injury. 52% did not have tetanus immunization.

61% of workers had 3 or more symptoms since commencing work while only 4.5% did not report any symptom. The most common symptoms were generalized symptoms (76%), musculoskeletal complaints (42%), abdominal complaints (38%), skin- related symptoms (36%), and neuro- psychiatric symptoms (26%). 27% reported injury in current occupation.

Discussion This marginalized working population has a high disease burden prior to commencing work, and made worse in their current occupation because of exposure to

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physical, chemical, and other hazards in the workplace. Access to health care is crucial for this population but remains a challenge- only 30% attended despite health and service promotion and free services. Most workers spend long periods at work and do not access a clinic if too far- the factories are within 350 meter radius of a clinic. Health seeking behaviour is particularly poor among young males. Employers play an important role allowing workers to attend the clinic during work time permitting clinics to be opened on working days. Rate of 2nd tetanus dose was low (50%) attributed to frequent changes in work shift, occupation, and residence of this mobile population. The model of care is evolving but involvement of stakeholders is needed to prevent exposure and improve conditions in the workplace and to develop innovative strategies such as a health financing program for small scale factories.

GLOBAL PARTNERSHIPS TO CONTEST FLAWED HEALTH IMPACT ASSESSMENTS. A CASE STUDY ON PROPOSED COAL-BED METHANE EXTRACTION IN SCOTLAND

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Introduction.

Fracked shale gas and coal bed methane (unconventional gas or UG) are targets for exploitation in Scotland by international companies. Forth Valley in Central Scotland in 2010s saw the first Scottish planning application for UG that was referred to a public enquiry in 2013/4 which has yet to report at the time of writing. There is now much debate about what public health threats (worker and community) may emerge if planning is granted. The enquiry was contested. The UG multinational company represented by its staff and expert planning lawyers used consultants who produced environmental statements on the low public health risks and high benefits of the proposed development. UK and Scottish agencies presented evidence on the effective regulation of and minimal health risks from UG. Local authorities used different consultants to produce environmental statements indicating some geological problems. Local communities organised a campaign group to oppose the planning application.

“Partnerships” – formal and informal.

The campaign group linked formally with lawyers from Australia, primary care physicians from Australia, geologists in France, global environmental NGOs and trade unions working in Europe and the UK, radiation experts from England and public health researchers from Scotland. Informal links emerged with public health researchers from the USA. Links provided important information and arguments to contest the application.

Problem solving.

The links provided key information beyond published sources and included analyses and good practice examples to contest the application ensuring up to date and relevant information from technical studies and environmental impact assessments from the USA and Australia were available. This helped campaigners with limited resources to act quickly. Specific Scottish planning law problems emerged as did a lack of independent research by Scottish public health agencies and services. Instead questionable Public Health England UG reviews were cited by industry and paid consultants but were challenged as were some universal/global problems that emerged relating to adequate access to information, scientific support, resources and time.

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Challenges in applying the concept in another country/region or to another question.

Industry contested the relevance of critical assessments from other countries because of different legal systems, geology and different population health. They also challenged the impact of UG on global climate change. The absence of evidence was used as evidence of absence of any UG public health threats. 'Industry good practice' and 'effective regulation' of the industry were accepted by many agencies but contested by the campaign groups drawing on international information.

Lessons learned and best practices. Could this be a model for others?

Arguments from UG international corporations across the world are remarkably similar. Global and local public health threats are frequently similar across the world. Scientists and communities contesting UG development may not always need to produce entirely new defences to counter industry if similar threats to public health exist in Forth Valley or Colorado or New South Wales and if the health impact assessment (HIA) techniques needed to assess those threats are similar. Networks for the international pooling of scientific data, community campaign policies and specific HIAs on UG could be further refined and adopted globally.

INITIAL SITE ASSESSMENTS IN POLLUTED COMMUNITIES IN ARMENIA

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Background: Through the Toxic Site Identification Program (TSIP), the Blacksmith Institute of the US conducts initial site assessments (ISA) of communities in more than 60 low- and middle-income countries in Asia, Africa, Latin America and Eastern Europe, including Armenia, where industrial pollutants contaminate soil or water and potentially impact human health. According to the Republic of Armenia (RA) Ministry of Energy and Natural Resources there are 400 active mines (including 22 metal mines). According to the RA Ministry of Emergency Situations, there are 19 tailings ponds: eight cultivated, nine currently active, one newly developed and one abandoned. The aim of this study was to conduct environmental ISAs in communities adjacent to mining and smelting industries or tailing ponds potentially polluted with heavy metals. Blacksmith Institute sponsored the project in RA and provided technical support.

Methods: The research team from the American University of Armenia School of Public Health and Acopian Center for the Environment and representatives of relevant Ministries participated in a two-day technical workshop on the methodology and protocols of the ISA. The research team, based on expert opinions from the Ministries of Nature Protection, Health, and Emergency Situations and on the results of a comprehensive document review, identified 25 communities from six provinces of Armenia that include toxic sites; 19 of them were adjacent to mining and smelting industries. The assessment included observations/descriptions of community conditions, rapid stakeholder analysis with 115 participants that included community residents, local authorities (health providers and mayor's office staff) and representatives of NGOs. In addition, the team collected 92 soil (40 residential, 29 agricultural and 23 school/kindergarten) samples from the residential areas of selected communities and tested for heavy metals in the environmental laboratory of the Ministry of Nature Protection using inductively coupled plasma mass spectrometry with total dissolution prior to analysis.

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Results: In residential soil samples 53% exceeded the Maximum Allowable Concentration (MAC) for arsenic, 5% for cadmium, 5% for lead and 65% for chromium. In samples taken from school and kindergarten playgrounds 39% exceeded the MAC for arsenic and 39% for chromium. In agricultural soil samples 35% exceeded the MAC for arsenic, 52% for chromium, 7% for lead and 3% for cadmium. The assessment revealed that tailing ponds did not have proper warning signs or fences, abandoned ones were used as pasture sites or gardens, in some communities the residents used the tailings as construction materials, and there were leakages of tailings from broken pipes inside the communities. Children were exposed to heavy metals mainly through soil in their yards and playgrounds. Interviews with residents, health providers, and local government representatives revealed several problems related to the socio-economic impact of mining on affected communities: 1) low salaries of workers in mining industry, 2) absence of health insurance for workers and affected community members, 3) damage to residential areas because of explosions, 4) dust, noise and smell disturbing the residents of those communities, 5) lack of trust towards local and national decision-makers and fear of raising concerns, 6) forcing (by mining industry) community residents to sell their land for very low compensation, and 7) low competitiveness of agricultural products because of their potential contamination with heavy metals.

Conclusion: This model of international collaboration builds environmental assessment skills and experience in the selected countries and provides data for future research, policy improvements and remediation. The results of the ISA suggested the need for 1) conducting thorough risk assessments in the most affected communities; 2) developing local and national action plans to address the contamination; and 3) conducting community empowerment programs to reduce environmental and health risks in those communities. All these activities need to be implemented in close collaboration with the Government of RA. The ISA approach could be used for other sources of pollutants that pose a high risk of environmental contamination.

RISK ASSESSMENT ON TARANTO (ITALY) INTEGRATED STEEL WORKS

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Background. Lack of information on environmental health issues in the Integrated Pollution Prevention and Control Permit (IPPC) from a large integrated steel industry resulted in the intervention by a criminal law court. The epidemiological experts proved a causal association between steel emissions and both short-term and long-term health effects in the local population that lead to the administrative seizure, risk of job loss for 12,000 blue collar workers and inter-institutional conflicts. As a consequence of this situation, a regional law required that an environmental health assessment should be carried out including epidemiological evaluation and risk assessment, which is the subject of this presentation.

Aims. Evaluation of the overall inhalation cancer risks due to emissions before and after the implementation a new regulatory IPPC permit.

Methods. Data collected from 183 stack emissions and 5 diffuse sources were taken into account for specific carcinogenic pollutants (PAHs, Benzene, Dioxins, PCBs, As, Cd, CrVI, Ni, Pb). Annual average concentrations, referred to each emission setting, were estimated through a modeling system including a diagnostic meteorological model (SWIFT), a turbulence preprocessor (SURFPRO) and a Lagrangian particle dispersion model (SPRAY). From estimated concentrations and using the equations proposed by the California OEHHA Air Toxics Hot Spots Risk Assessment Guidelines, the inhalation dose for each pollutant was calculated and then multiplied by specific inhalation slope factor to derive life-time cancer risk prediction for each pollutant. The individual pollutant cancer risks were also added to obtain the overall plant inhalation cancer risks that were plotted in GIS maps.

Results. A total of 22,516 and 12,078 inhabitants (out of 200,000), were estimated respectively for pre- and post- IPPC implementation scenarios, as showing an additional life-time cancer risk higher than 1:10,000.

Conclusions. This risk assessment shows the effectiveness of IPPC permit reduced emissions resulting in decreased lifetime cancer risks in the local population, although a residual risk still needs further preventive intervention.

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EPIDEMIOLOGICAL SURVEILLANCE OF OCCUPATIONAL CANCER IN LATIN AMERICAN AND OTHER RECENTLY INDUSTRIALIZED COUNTRIES

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The value and the relevance of the identification of occupational hazards are universal: valid findings are useful (and should be used) for the protection of workers independently of the country or continent where they have been obtained. Nevertheless, country specific studies are important for more than one reason. In the first place, population attributable risks (and the consequent estimate of the number of preventable cases of disease) are place- and time specific. Local estimates will also expedite the awareness of the need for remediation within the Public Health Authorities and within the population. Finally, the implementation of local epidemiological studies gives origin to local public health expertise, so filling a regrettable gap.

The talk will be focused on epidemiological knowledge on occupational cancer in recently industrialized countries, with particular attention to Latin American countries. Two sets of data will be considered: analytical epidemiological studies (i.e. studies providing risk estimates based on exposure and outcome at the individual level) reported in the indexed scientific literature and mesothelioma incidence estimated through cancer registries as reported by the International Association of Cancer Registries.

In fact, in recently industrialized countries, epidemiological studies have been carried out to an extremely limited extent. For instance, with regard to mesothelioma, in the whole of Latin America, in spite of an annual consumption of 240.000 tons of asbestos in 2000, only one study (in Mexico, Aguilar Madrid et al Amer J Industr Med 2010) has provided estimates of attributable risks (which were similar to those of traditionally industrialized countries). The available estimates of incidence rates of mesothelioma in recently industrialized countries are limited to some areas and their interpretation is problematic. The paucity of local information on occupational cancer likely contributes to the insufficient attention given to prevention (eg lack of asbestos ban in many countries).

In order to overcome many of the current limitations of occupational cancer surveillance, collaboration with the expertise existing in traditionally industrialized countries is desirable.

DO INCREMENTS OF CUMULATIVE EXPOSURE TO ASBESTOS INCREASE MESOTHELIOMA INCIDENCE AND ADVANCE TIME TO EVENT?

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The title introduces two questions and both are not only of academic relevance but have also bearing on social and forensic consequences for mesothelioma patients.

La Vecchia and Boffetta claimed that, by reviewing the recent literature, they found “consistent evidence showing that, for workers exposed in the distant past, the risk of mesothelioma is not appreciably modified by subsequent exposures”. [1] This statement is at variance with the long established dose-response relationship of asbestos with mesothelioma: no threshold is predicted beyond which mesothelioma incidence would cease to increase. [2]

Further, a systematic review of the literature on the dose-response relationship between cumulative exposure to asbestos and mesothelioma mortality or incidence provided firm evidence of proportionality between the two. [3] Lastly, the results of the studies reviewed by La Vecchia and Boffetta did not support their point of view. [4]

Our conclusions, as to the first question, are that: (i) all increments in cumulative asbestos exposure entail an increase in mesothelioma incidence; (ii) all other parameters being equal, its amount depends also on the time when dose was delivered, as a power of time elapsed from exposure is an additional determinant of incidence. [3]

The existence of a relationship between increased incidence of an event in a population and the average time to event is a fundamental epidemiological concept: time to event is the reciprocal of the incidence rate. Following exposure to a causative agent, however, acceleration of failure time might be observed only under certain conditions: that the event is unavoidable, so no competitive mortality exists, and that the population is followed to extinction. [5] These conditions are not usually met, in particular when interest is in cause-specific mortality and competitive causes of death exist and account for a large proportion of overall mortality. While increases in rates can nonetheless be measured, acceleration of failure time becomes directly unobservable, and can only indirectly be estimated. [6]

Ignorance of this fundamental limitation to the use of failure time as a measure of exposure effect may lead to misleading data analyses and incorrect conclusions. [7] A recent example is present in the mesothelioma literature. [8, 9]

In agreement with Berry, [6] we conclude that advancement of time to event accompanies the increase in mesothelioma incidence caused by exposure to asbestos, even when it can not be directly measured.

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